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Weed Control Biology

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Summary notes – CONFIDENTIAL –

Invited:

Present:
Howard Stott USDM
Pyle Steve USGR
Michel Albrecht CHBS
Hofer Urs CHBS
Reynolds Jeremy CHBS
Miller Brett CHBS
Spinney Mark GBJH
Vail Gordon USGR
Johnson Mike USGR
Palmer Eric USVB
Longstaff Adrian GBJH
Dallimore Jon GBJH
Moss Michael USGR
Cully Scott USDM
Beckett Tom USGR
Bachiega Andre BRSP
Manley Brian USRE
Drost Dirk USGR
Stypa Marian USGR
Sherriff Matthew AUSY

Partial participation:
Simmons Dana USGR
Kaundun Deepak GBJH
Battles Bruce USSL
Franssen Aaron USPE
Moses Adrian USDM
Beaupre Barry USDM
Moseley Carroll USGR
Tingle Chris USDM
Abell Craig USDM
Nichols Craig USDM
Bruns Dain USDM
Thomas Dave USDM
Krumm Jeffrey USDM
Schirmacher Kathrin USDM
Leetch Mike USDM
Steiner Pat USDM
Jain Rakesh USVB
Wichert Rex USGR
Lins Ryan USDM
Payne Scott USFS
Mroczkiewicz Steve USDM
Foresman Chuck USGR
Elser David CHBS
Taylor Shane USDM

Copy:
Alan Dowling, Research Chemistry
Bill Whittingham, Research Chemistry
Roger Salmon, Research Chemistry
Nigel Willetts, Research Chemistry
Mike Turnbull, Research Chemistry
Clare Elliott, Research Chemistry
Steve Smith, Chemistry Group Leader
Jutta Boehmer, Chem. Group Leader
Chris Mathews, Chem. Group Leader
Matt Cordingley, Project TL WCR
Claudio Screpanti, Project TL WCR
Gavin Hall, Project TL WCR
Kay Fullick, Project TL WCR
Deepak Kaundun, Project TL WCR
Anne Rees, Discovery TL
David Adams, Chemistry Design
Nathan Kidley, Chemistry Design
Eric Clarke, Chemistry Design
Steven Ward, IP Section Head
Catherine Piper, Formulation Res.
Kate Sharples, Bioscience
Dave Pearson, Environmental Safety
Pratibha Mistry, Human Safety
Ruediger Kotzian, Global HER Tech
Gael Le Goupil, Global HER Tech
Derek Cornes, Global HER Dev
Dave Hughes, MOA Group Lead
Deborah Keith, CPR Portfolio Lead
Glynn Mitchell, PST Leader
Andrew Plant, Head Res. Chemistry
Josef Amrein, Portfolio Coordination
Martin Kissling, Portfolio Planner
David Youle, Head of B&L
Klaus Gehmann, Head Prod. Biology

Location:	Rend Lake College Ina, Illinois	**Date:** **Duration:**	June 26th, 2009 12:00 – 13:00 (CST)
Minutes:	Ian Zelaya	**No. pages:**	1/6
Concerning:	**Summary notes: US Herbicides Field Visit - Stage 1, June 22-26 2009**		

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[redacted]

Protocol: [redacted] (Stage 1.2; Late Lead Finding)

Title: Evaluation of dicot and grass weed control and crop tolerance of new chemistry compounds in CORN - PRE- and POST-EM in US

Objectives: (1) Estimate the potency and overall efficacy on key target weed species of [redacted]; (2) Compare the level of maize selectivity of [redacted] (3) Evaluate the synergy of [redacted] and [redacted] in reference to the atrazine and [redacted]

Distribution: Schirmacher (IL); Cully (IL); Minton (TX) (trials visited)

Summary:
- [redacted] has similar activity to atrazine POST but was less active PRE
- [redacted] was clearly more active compared to [redacted] and atrazine; the level of increased activity vs. these standards was difficult to ascertain as [redacted] was tested at a single rate (no rate response)
- Consistent with glasshouse data, [redacted] had better grass spectrum compared to atrazine (*Digitaria* and *Setaria*) and similar broad-leaf spectrum (except for *Amaranthus* which was a gap)
- At the 500 g ai/ha rate PRE, atrazine had slightly better activity compared to [redacted]
- Both [redacted] had limited maize selectivity POST (PRE was acceptable)
- In mixture with [redacted] (500 g ai/ha + 100 g ai/ha PRE; 500 g ai/ha + 75 g ai/ha POST), both atrazine and [redacted] had excellent activity and there was evidence of synergism. In POST, [redacted] appeared more active compared to the atrazine and [redacted]; however PRE, the atrazine and [redacted] looked more active

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[redacted]

Protocol: [redacted] (Stage 1.2; Late Lead Finding)

Title: Evaluation of dicot weed control and crop tolerance of new chemistry compounds in CORN - PRE- and POST-EM in US

Objectives: (1) Evaluate crop tolerance and overall efficacy on key target weed species of [redacted] (2) Compare the level of maize selectivity of [redacted] to dicamba and [redacted], and (3) Compare the potency, efficacy and crop tolerance of [redacted]

Distribution: Schirmacher (IL); Cully (IL); Holloway (TN) (trials visited)

Summary:
- Progress made from the leads tested last year
- Overall, [redacted] compounds were more active EPOST than PRE
- Compared to dicamba, compounds still looked less active
- [redacted] was safe to maize at 30 g and 60 g ai/ha (but not at 120 g ai/ha)
- [redacted] was the most active of the [redacted] but also the less selective to maize
- [redacted] was safe EPOST, but less active than [redacted]
- [redacted] was safe to maize at the rates tested (60 g PRE and 30 g ePOST); the activity ePOST was better compared to [redacted]
- [redacted] was active, particularly EPOST, but was not selective to maize
- Recommendations: (1) focus priority on consistent EPOST activity, (2) consider further

adjuvant work beyond recommendations with NIS, and (3) focus activity on glyphosate-resistant weed species, *Conyza*, *Amaranthus*, and *Ambrosia* (e.g. 2,4-D is not good on *Amaranthus*); need to be different

- It is too early to make clear decisions; data needs to be fully analyzed

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Protocols: [redacted] **(Stage 1.2; Late Lead Finding)**

Title: Evaluation of crop tolerance and broadleaf weed control in glyphosate-tolerant SOYBEANS - PRE-EM [redacted] and EPOST [redacted] n US

Objectives: [redacted] (1) Evaluate soybean tolerance (level and time pattern of injury development), (2) Evaluate the activity on the key dicot weeds, and (3) Compare performance to dicamba; [redacted] (1) Evaluate soybean tolerance (level and time pattern of injury development), (2) Evaluate the activity on the key dicot weeds, (3) Determine if the new research compounds have a robust selectivity under field conditions and offer good broadleaf weed control, and (4) Compare [redacted] post-emergence to the [redacted]

Distribution: Nichols (MO); Moses (IA); Cully (IL); Black (AR) (trials visited)

Summary:

- Overall, [redacted] were more active EPOST than PRE
- EPOST, [redacted] was injurious to soybeans at the rates tested; [redacted] was safer and was injurious only at the top rate of 125 g ai/ha
- Activity on broad-leaf weeds was generally worse than dicamba (PRE), glyphosate (EPOST) and Flexstar GT (fomesafen+glyphosate) (EPOST)
- The [redacted] was not selective to soybeans; the [redacted] had better selectivity compared to [redacted] but still injurious at the rates tested (250 g ai/ha and 500 g ai/ha)
- Recommendations: (1) focus priority on consistent EPOST activity and promising soybean selectivity, (2) consider further adjuvant work (similar to maize), and (3) focus activity on glyphosate-resistant weed species, *Conyza*, *Amaranthus*, and *Ambrosia*

[redacted]

Protocol: [redacted] **(Stage 1.4; Optimization)**

Title: Evaluation of grass and dicot weed control, crop selectivity and safener response of lead compounds in CORN - PRE-EM in the US

Objectives: (1) Compare the activity of [redacted] on key target weed species, (2) Assess whether the addition of the safener [redacted] reduces the level of observed corn phytotoxicity on the [redacted] and (3) Evaluate the relative weed efficacy and crop selectivity of the [redacted] to the commercial standards [redacted]

Distribution: Bruns (OH); Thomas (IL); Nichols (MO); Moses (IA); Lengkeek (MI); Mroczkiewicz (IN), Hitchner (Delmarva); Holloway (TN); Sanders (MS); Minton (TX) (trials visited)

Summary:

- Overall good conditions for PRE activity (e.g. precipitation and performance of standards)
- PRE activity correlated well with (1) activation rain, (2) weed infestation and (3) soil organic matter
- In high organic matter soils, 800 g ai/ha required (maybe more) for consistent response. In lower organic soils, a minimum of 400 g ai/ha was required, but 600 g ai/ha is preferred

- Approximately 600 g ai/ha was comparable to [redacted] at the 1x rate for the soil type
- In some conditions of high SETFA infestation (Nichols, MO), 800 g ai/ha had only partial suppression of this target species
- Performance under dry soil conditions was not confirmed; it is perceived that the DASH compounds perform similar to [redacted] for moisture required for activation. Recommendation: follow this under controlled conditions
- It is important to evaluate consistency of performance; last year 600 g ai/ha was consistent, but this year we may need 800 g ai/ha
- [redacted] similar to [redacted] both 1x less active compared to [redacted]
- No maize injury observed with any of the treatments and hence the effect of [redacted] could not be assessed

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Protocol: [redacted] **(Stage 1.4; Optimization)**

Title: Evaluation of grass and dicot weed control, crop selectivity and safener response of lead compounds in combination with [redacted] in CORN - PRE-EM in the US

Objectives: (1) Compare the overall weed efficacy of [redacted] in mixtures with [redacted] to mixtures with [redacted] (2) Compare the level of crop tolerance of [redacted] to mixtures with [redacted], (3) Compare the overall weed efficacy and crop selectivity of [redacted] in mixtures with [redacted] to the commercial standard [redacted]

Distribution: Lengkeek (MI); Mroczkiewicz (IN); Nichols (MO); Hitchner (Delmarva); Lins (MN); Cully (IL); Holloway (TN); Minton (TX) (trials visited)

Summary:
- No crop injury reported; most treatment included benoxacor
- Good activation rain this year thus overall good performance of PRE treatments
- In combination with [redacted], both [redacted] required 800 g ai/ha for broad-spectrum weed control comparable to [redacted] (particularly grasses). [redacted] required a lower [redacted] rate; in some cases 300 g ai/ha was required. Under high SETFA populations (Nichols, MO), none of the [redacted] treatments were as good as the [redacted]
- Performance under dry weather was not confirmed. Recommendation: follow this under controlled conditions
- In low organic matter soils, excellent performance of most treatments (S Cully)
- The standards [redacted] (1500 g + 200 g) and [redacted] (100 g + 200 g) provided consistent control

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Protocol: [redacted] **(Stage 1.3; Optimization)**

Title: Evaluation of grass and dicot weed control, crop tolerance and safener response of new chemistry compounds in CORN - PRE-EM in the US

Objectives: (1) Estimate potency and overall efficacy on key grass weed species of [redacted] (2) Evaluate the response of [redacted] to the safener [redacted] at a H:S-ratio of 5:1, and (3) Compare the level of maize tolerance of [redacted]

Distribution: Bruns (OH); Thomas (IL); Krumm (WI); Mroczkiewicz (IN); Hitchner (Delmarva); Moses (IA); Cully (IL); Minton (TX); Holloway (TN); Sanders (MS) (trials visited)

Summary:

- Good activation rain for most trial sites visited
- Overall [redacted] had similar performance to [redacted] and both compounds had better and more consistent performance compared to [redacted]
- Similar to [redacted], 800 g ai/ha was required for consistent PRE performance; a lower rate (600 g ai/ha) may be enough in low organic matter soils (S Cully)
- Performance under dry weather was not confirmed. Recommendation: follow this under controlled conditions.
- Good activation rain this year thus better performance
- Better performance of compounds in low organic matter soils (C Cully) versus higher organic matter soils (C Moses)
- [redacted] safener was not assessed given the limited maize injury observed

[redacted]

Protocol: [redacted] **(Stage 1.3: Optimization)**
Title: Evaluate the effect of [redacted] on [redacted] for POST-emergence weed control and crop tolerance in V3-V5 stage GT corn
Objectives: (1) evaluate effect of four safeners - [redacted] - on tolerance of a range of different corn varieties, (2) evaluate the efficacy of [redacted] plus [redacted] in corn - alone and in combination with safeners, (3) define H:S-ratio needed for acceptable corn selectivity and (4) evaluate effect safener on grass activity
Distribution: Moses (Ames, IA); Moses (Ogden, IA); Mroczkiewicz (IN); Cully (IL) (trials visited)

Summary:

- The [redacted] resulted in unacceptable maize injury (~15-20% at 1200 g ai/ha and ~30-40% at 2400 g ai/ha)
- Good [redacted] safening observed at 10 g plus 1200 g ai/ha of A17329 (1:7 ratio of [redacted] and 20 g plus 2400 g of [redacted]
- Treatment #2 (20 g of [redacted] plus 2400 g of [redacted] was similar or safer compared to [redacted] at 2200 g ai/ha
- [redacted] was equally effective compared to [redacted] in safening [redacted]
- [redacted] was less effective than both [redacted] at 75 g plus 1200 g ai/ha of [redacted] safening was marginal
- [redacted] was the less effective of all safeners tested. Maize injury was unacceptable when 60 g or 120 g of [redacted] were mixed with 1200 g and 2400 g ai/ha of [redacted], respectively
- The [redacted] was equally or less injurious to maize compared to [redacted] (depending on location), but both formulation were safer than the [redacted] In addition, mixtures of [redacted] (60 g or 120 g) did not result in acceptable crop safety

[redacted]

Protocol: [redacted] **(Stage 1.3; Optimization)**
Title: POST emergence control of tough weeds: evaluation of new NSH as POST emergence herbicide US
Objectives: (1) compare the efficacy of [redacted] versus the standard glyphosate, (2) compare the spectrum and rate response of [redacted] versus [redacted] (3) evaluate the potential use of [redacted] in pre-plant burndown and plant-back (crop rotation) scenarios
Distribution: Bruns (OH); Thomas (IL); Krumm (WI); Mroczkiewicz (IN); Hitchner (Delmarva); Moses (IA); Cully (IL); Minton (TX); Holloway (TN); Sanders (MS) (trials visited)

Summary:

- [redacted] no [redacted] injury observed; good plant-back fit (limited crop rotation limitations)
- [redacted] no [redacted] injury observed; good pre-plant burndown potential
- [redacted] generally good efficacy observed at 600 g ai/ha of [redacted]; however, the rate-response was flat (no increase in efficacy observed at rates of 750 g, 900 g and 1200 g ai/ha compared to 600 g ai/ha of [redacted])
- Good activity of [redacted] on glyphosate-resistant common waterhemp (Southern Illinois University site)
- In mixture with [redacted] (420 g ae/ha), 750 g ai/ha of [redacted] gave good efficacy. There was an indication at lower rates of [redacted] the mixture may be antagonistic (A Moses)
- [redacted] was consistently weak on common lambsquarters (*Chenopodium*)
- Recommendations: (1) comparison of [redacted] should be made to both [redacted] (burn-down and in-crop HTC) and [redacted] (TNV and glyphosate resistant weeds) (2) important to demonstrate the advantage versus [redacted] preliminary assessment suggest that it may be weaker vs [redacted], (3) application volume (300 L/ha) may be too high, particularly for maximum [redacted] efficacy; consider lower application volumes, (4) in-crop use needs to control [redacted] susceptible and [redacted] resistant biotypes of common waterhemp, horseweed and ragweeds
- A perfect molecule is not needed. Very good results observed thus far plus Chuck likes it!

Adjourned at 13:10 (CST) on June 26th, 2009